Name ______________________ Class __________ Date __________

3-3 Practice

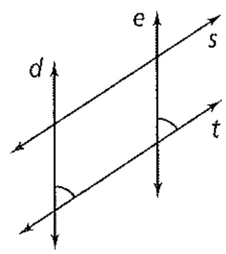
KEY

Form G

Proving Lines Parallel

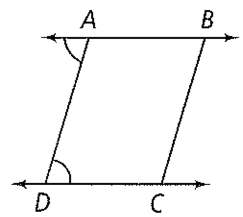
Which lines or segments are parallel? Justify your answer.

1.



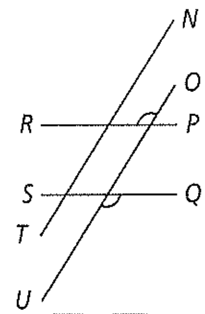
$d \parallel e$; corr. angles

2.



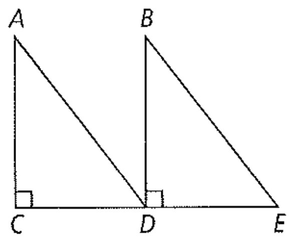
$\overleftrightarrow{AB} \parallel \overleftrightarrow{DC}$; alt. int. angles

3.



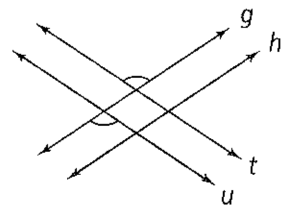
$\overline{RP} \parallel \overline{SQ}$; alt. ext. ∠s

4.



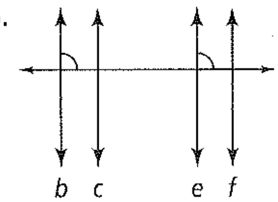
$\overline{AC} \parallel \overline{BD}$; corr. angles

5.



$t \parallel u$; alt. ext. angles

6.

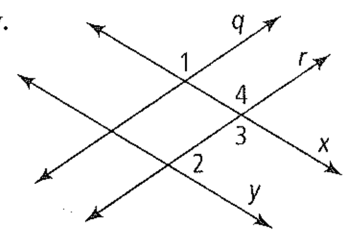


$b \parallel e$; corr. angles

7. Developing Proof Complete the flow proof below.

Given: ∠1 and ∠2 are supplementary; $x \parallel y$

Prove: $q \parallel r$



$\boxed{x \parallel y}$ Given → $\boxed{\angle 2 \text{ and } \angle 3 \text{ are suppl.}}$ Same-side interior ∠s are suppl.

$\boxed{\angle 1 \text{ and } \angle 2 \text{ are suppl.}}$ Given

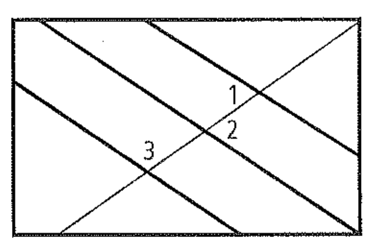
→ $\boxed{\angle 1 \cong \angle 3}$ ∠s suppl. to the same ∠ are ≅.

$\boxed{\angle 3 \cong \angle 4}$ Vert. ∠s are ≅.

→ $\boxed{\angle 1 \cong \angle 4}$ Transitive Property of ≅ → $\boxed{q \parallel r}$ If corresp. ∠s are ≅, lines are ∥.

8. The art club is designing a new flag for the marching band. In the diagram, $m\angle 1 = 45$, $m\angle 2 = 45$, and $m\angle 3 = 145$. Does the flag contain three parallel lines? Explain.

The top two lines are parallel because ∠1 ≅ ∠2 and they are alt. int. ∠s. The angle vertical to ∠2 is suppl. to ∠3. Because $45 + 145 \neq 180$, the bottom line is not parallel to the top two.



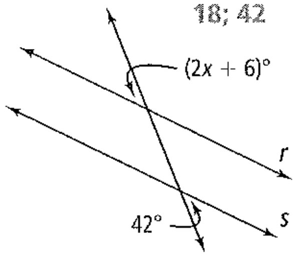
Name ______________________ Class ____________ Date ____________

3-3 Practice (continued) — Form G

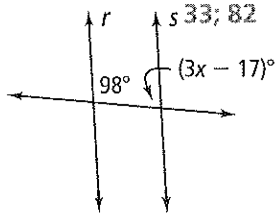
Proving Lines Parallel

Algebra **Determine the value of x for which $r \parallel s$. Then find the measure of each labeled angle.**

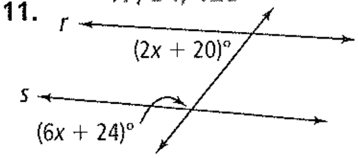
9. 18; 42



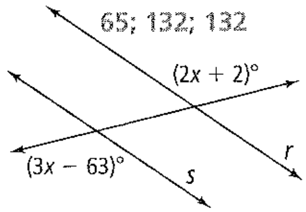
10. 33; 82



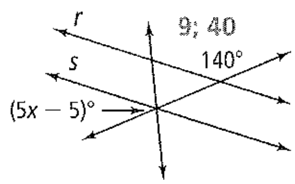
11. 17; 54; 126



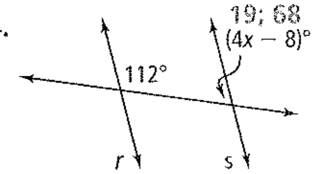
12. 65; 132; 132



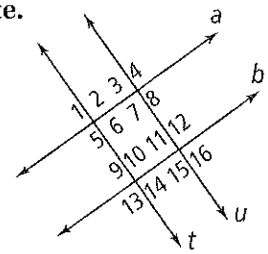
13. 9; 40



14. 19; 68



Developing Proof **Use the given information to determine which lines, if any, are parallel. Justify each conclusion with a theorem or postulate.**



15. $\angle 11$ is supplementary to $\angle 10$.
$t \parallel u$; same-side int. ∠s are suppl.

16. $\angle 6 \cong \angle 9$
$a \parallel b$; alt. int. ∠s are ≅.

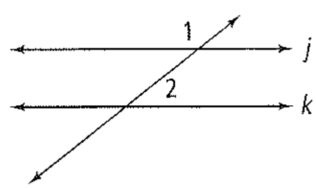
17. $\angle 13$ is supplementary to $\angle 14$.
no lines; linear pair

18. $\angle 13 \cong \angle 15$
$t \parallel u$; corr. ∠s are ≅.

19. $\angle 12$ is supplementary to $\angle 3$.
$a \parallel b$; $\angle 12$ and $\angle 16$ are linear pair; alt. ext. ∠s are ≅.

20. $\angle 2 \cong \angle 13$
$a \parallel b$; alt. ext. ∠s are ≅.

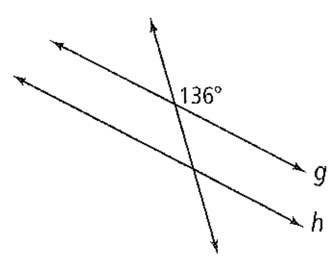
Algebra **Determine the value of x for which $j \parallel k$. Then find $m\angle 1$ and $m\angle 2$.**



21. $m\angle 1 = 7x + 14$, $m\angle 2 = 2x + 4$ 18; 140; 40

22. $m\angle 1 = 4x - 5$, $m\angle 2 = x + 20$ 33; 127; 53

23. **Open-Ended** Choose a value for x and write an expression for one of the angles in terms of x that will prove that g and h are parallel. Check students' work.



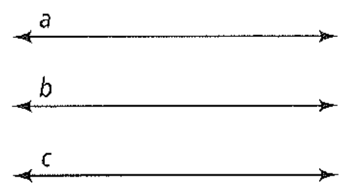
Name ____________________ Class __________ Date __________

3-4 Reteaching

Parallel and Perpendicular Lines

You can use angle pairs to prove that lines are parallel. The postulates and theorems you learned are the basis for other theorems about parallel and perpendicular lines.

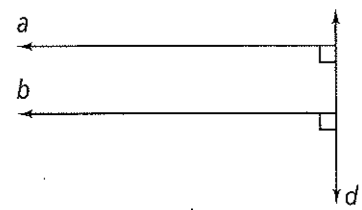
Theorem 3-8: Transitive Property of Parallel Lines



If two lines are parallel to the same line, then they are parallel to each other.

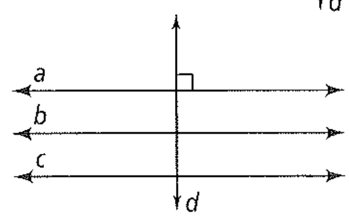
If $a \parallel b$ and $b \parallel c$, then $a \parallel c$. Lines a, b, and c can be in different planes.

Theorem 3-9: If two lines are perpendicular to the same line, then those two lines are parallel to each other.



This is only true if all the lines are in the same plane. If $a \perp d$ and $b \perp d$, then $a \parallel b$.

Theorem 3-10: Perpendicular Transversal Theorem

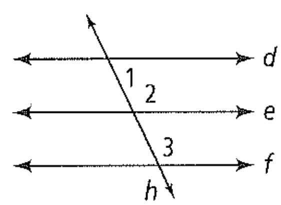


If a line is perpendicular to one of two parallel lines, then it is also perpendicular to the other line.

This is only true if all the lines are in the same plane. If $a \parallel b$ and c, and $a \perp d$, then $b \perp d$, and $c \perp d$.

Exercises

1. Complete this paragraph proof of Theorem 3-8.

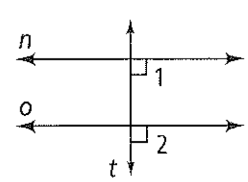


Given: $d \parallel e$, $e \parallel f$

Prove: $d \parallel f$

Proof: Because it is given that $d \parallel e$, then $\angle 1$ is supplementary to $\angle 2$ by the Same-Side Int. Angles Postulate. Because it is given that $e \parallel f$, then $\angle 2 \cong \angle 3$ by the Corresponding Angles Theorem. So, by substitution, $\angle 1$ is supplementary to $\angle$ 3. By the Converse of the Same-Side Int. Angles Postulate, $d \parallel f$.

2. Write a paragraph proof of Theorem 3-9.



Given: $t \perp n$, $t \perp o$

Prove: $n \parallel o$

Given that $t \perp n$ and $t \perp o$, $m\angle 1 = 90$ and $m\angle 2 = 90$, by def. of perpendicular lines. Thus $\angle 1 \cong \angle 2$. So, $n \parallel o$ because of the Converse of the Corr. ∠s Thm.

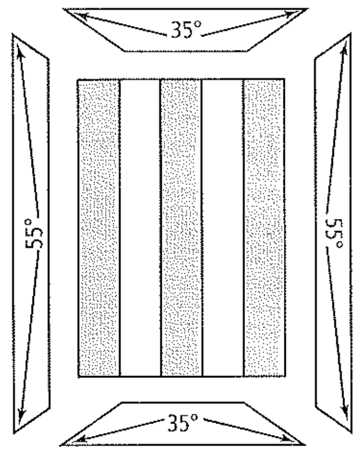
Name ______________________ Class __________ Date __________

3-4 Reteaching (continued)

Parallel and Perpendicular Lines

Problem

A carpenter is building a cabinet. A decorative door will be set into an outer frame.



a. If the lines on the door are perpendicular to the top of the outer frame, what must be true about the lines?

b. The outer frame is made of four separate pieces of molding. Each piece has angled corners as shown. When the pieces are fitted together, will each set of sides be parallel? Explain.

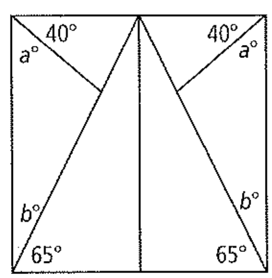
c. According to Theorem 3-9, lines that are perpendicular to the same line are parallel to each other. So, since each line is perpendicular to the top of the outer frame, all the lines are parallel.

Know	Need	Plan
The angles for the top and bottom pieces are 35°. The angles for the sides are 55°.	Determine whether each set of sides will be parallel.	Draw the pieces as fitted together to determine the measures of the new angles formed. Use this to decide if each set of sides will be parallel.

The new angle is the sum of the angles that come together. Since $35 + 55 = 90$, the pieces form right angles. Two lines that are perpendicular to the same line are parallel. So, each set of sides is parallel.

Exercises

3. An artist is building a mosaic. The mosaic consists of the repeating pattern shown at the right. What must be true of a and b to ensure that the sides of the mosaic are parallel?
$a = 50$ and $b = 25$



4. **Error Analysis** A student says that according to Theorem 3-10, if $\overleftrightarrow{AD} \parallel \overleftrightarrow{CF}$ and $\overleftrightarrow{AD} \perp \overleftrightarrow{AB}$, then $\overleftrightarrow{CF} \perp \overleftrightarrow{AB}$. Explain the student's error.
$\overleftrightarrow{AB}$ and $\overleftrightarrow{CF}$ are in different planes.